



## Complete Summary

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### GUIDELINE TITLE

Health professional's guide to rehabilitation of the patient with osteoporosis.

### BIBLIOGRAPHIC SOURCE(S)

National Osteoporosis Foundation. Health professional's guide to rehabilitation of the patient with osteoporosis. Washington (DC): National Osteoporosis Foundation; 2003. 31 p. [10 references]

### GUIDELINE STATUS

This is the current release of the guideline.

## COMPLETE SUMMARY CONTENT

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## SCOPE

### DISEASE/CONDITION(S)

- Osteoporosis
- Osteoporosis-related fractures

### GUIDELINE CATEGORY

Prevention  
Rehabilitation

### CLINICAL SPECIALTY

Endocrinology  
Family Practice

Geriatrics  
Internal Medicine  
Obstetrics and Gynecology  
Orthopedic Surgery  
Physical Medicine and Rehabilitation

#### INTENDED USERS

Advanced Practice Nurses  
Allied Health Personnel  
Dietitians  
Physician Assistants  
Physicians

#### GUIDELINE OBJECTIVE(S)

To assist health professionals in understanding the principles of rehabilitation in osteoporosis and their application to the disorder

#### TARGET POPULATION

Patients with osteoporosis who have low bone mass or who have suffered an osteoporotic fracture

#### INTERVENTIONS AND PRACTICES CONSIDERED

##### Rehabilitation in Osteoporosis

1. Active lifestyle with regular exercise
2. Assessment of medical status, nutritional status, medication use, including physical, functional, psychological, and social status
3. Training for performance of activities of daily living (ADL) and safe movement
4. Assistive devices for ambulation and for reaching/lifting
5. Complete exercise program that includes weight-bearing aerobic activities for the skeleton, postural training, progressive resistance training for muscle and bone strengthening, stretching for tight soft tissues and joints, and balance training

##### Rehabilitation Following Hip Fracture

1. Physical therapy and exercise (especially hip-strengthening exercises)
2. Fall prevention strategies (e.g., gait, leg strength, flexibility, and balance training, as well as home-safety risk assessment)
3. Total body exercise program that is slowly progressive
4. Hip protectors

##### Rehabilitation Following Vertebral Fracture(s)

1. Exercises for spine extension strength, abdominal strength, strength around the shoulder blades, flexibility, balance, and posture.

2. Interventions for pain including heat/cold, facet injections, acupuncture, ultrasound, and transcutaneous electrical nerve stimulation (TENS)
3. Pharmacological and behavioral techniques for pain relief
4. Trunk orthoses (e.g., back brace, corset, Posture Training Support)
5. Surgical approaches, such as kyphoplasty and vertebroplasty

Note: Exercises to be avoided: Forward bending-of-the-spine or flexion exercises (especially in combination with twisting) and unsupported sitting for upper extremity weight-training (because slumping forward puts high loads on the spine)

#### Rehabilitation Following Distal Forearm Fracture

1. Splints, casts, arm elevation, early immobilization, and anti-edema control measures
2. Exercise that includes isometric contractions of the forearm muscle group while the arm is immobilized; active and passive range-of-motion exercises to all joints of the involved extremity (especially the shoulder and elbow); pronation and supination with forearm fully supported; and progressive resistive exercises and grip-strengthening measures (e.g., ball-squeezing)

#### MAJOR OUTCOMES CONSIDERED

- Risk for osteoporosis or osteoporotic fractures
- Incidence of osteoporosis or osteoporotic fractures
- Bone mineral density, bone turnover and loss
- Mortality related to osteoporotic hip fractures
- Morbidity (chronic pain, disability, deformity, depression) related to osteoporotic fractures
- Pain relief
- Medication side effects

### METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Medline and Cochrane served as search engines to identify relevant research.

#### NUMBER OF SOURCE DOCUMENTS

156

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

#### METHODS USED TO ANALYZE THE EVIDENCE

Review  
Review of Published Meta-Analyses

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

#### DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Based on the analysis of current research and consensus development, experts convened by the National Osteoporosis Foundation (NOF) developed this guideline to assist health professionals to understand the principles of rehabilitation and their applications to osteoporosis.

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

#### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

#### METHOD OF GUIDELINE VALIDATION

Peer Review

#### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

### RECOMMENDATIONS

#### MAJOR RECOMMENDATIONS

- Follow recommendations in the National Guideline Clearinghouse (NGC) summary of the National Osteoporosis Foundation's (NOF's) Physician's Guide to Prevention and Treatment of Osteoporosis regarding prevention and treatment of osteoporosis.

- Evaluate all fracture patients for osteoporosis and confirm diagnosis with a bone mineral density (BMD) test.
- Consider those individuals with vertebral or hip fractures to be candidates for treatment of osteoporosis.
- Understand and practice the general principles of exercise defined in this guide.
- Strive for an active lifestyle, starting in childhood, with regular exercise to build the highest possible bone mass and reduce losses of bone mass later in life.
- Avoid long-term immobilization and recommend partial bed rest, when necessary, for the shortest periods possible.
- Assess the patient's current medical status, nutritional status, and medication use, including her/his physical, functional, psychological, and social status, prior to prescribing a rehabilitation program.
- Provide training for the performance of safe activities of daily living (ADL) and safe movement, including transfers, lifting, and walking for people with or at high risk for osteoporosis.
- Include principles of safe movement in all activities, including walking, housework, and gardening, as these are practical ways to maintain fitness and bone mass in older populations and people of any age with low bone mass.
- Prescribe assistive devices for ambulation and for reaching/lifting to compensate for physiological deficits. Implement steps to correct underlying deficits whenever possible (e.g., improve balance and strengthen quadriceps muscles to allow a person to rise unassisted from a chair).
- Based on the initial condition of the patient, provide a complete exercise program: weight-bearing aerobic activities for the skeleton, postural training, progressive resistance training for muscle and bone strengthening, stretching for tight soft tissues and joints, and balance training. Proper exercise may improve physical performance/function, bone mass, muscle strength, and balance, as well as reduce the risk of falling. Maintain appropriate medical treatments and provide nutritional guidance, especially regarding adequate daily intake of calcium, vitamin D, and protein, in conjunction with recommended exercise.
- Evaluate the patient, her/his current medications, and the home environment for major risk factors for falls. Intervene as appropriate.
- Recommend hip protectors to reduce the occurrence of hip fractures, especially in elderly individuals at high risk for falls (e.g., previous fall, impaired balance, low vision). See the section on "Risk Factors for Osteoporotic Features" below.
- In patients with acute vertebral fractures or chronic pain after multiple vertebral fractures, consider prescribing trunk orthoses to provide pain relief by improving spine alignment and reducing the loads on the fracture sites. However, long-term bracing may lead to muscle weakness and further deconditioning.
- Implement effective pain management following vertebral fractures through a variety of physical, pharmacological, and behavioral techniques with the caveat that the benefits of pain relief should not be outweighed by side effects, such as disorientation or sedation that may result in falls.
- Consider kyphoplasty or vertebroplasty, new surgical interventions, for individuals with painful vertebral fractures that fail conservative management.

#### Risk Factors for Osteoporotic Fractures\*

- Personal history of low-impact fracture
- Current low BMD
- History of fracture in a first-degree relative
- Caucasian race
- Advanced age
- Female sex
- Dementia
- Impaired eyesight despite correction
- Recurrent falls
- Poor health/frailty
- Current smoker
- Low body weight (<127 lbs)
- Estrogen deficiency
- Low lifetime calcium intake
- Excessive use of alcohol (more than 2 drinks per day)
- Inadequate physical activity

\*The more risk factors women or men have, the greater the risk for fracture.

### Psychosocial Factors

Osteoporosis is a disease with social and psychological consequences. Multiple vertebral fractures or a hip fracture often cause emotional and interpersonal problems. Decrements in functional status, independence, social relationships, and emotional well-being are common following such fractures and contribute significantly to reduced quality of life. Depression is the single most prevalent and potentially most distressing psychological consequence of osteoporosis, but it can be successfully diagnosed and treated. A psychological assessment by medical and mental health practitioners should be an integral component of treating osteoporosis.

### Exercise and Movement

#### Guidelines for Safe Movement

Alignment is one of the most important concepts of posture and good body mechanics. It refers to the relationship of the head, shoulders, spine, and hips to each other. Proper alignment puts less stress on the spine and ensures good posture.

Avoid unsafe movements, including any exercise or activity that involves twisting the spine or bending forward from the waist with straight legs, such as sit-ups, stomach crunches, or toe touches.

1. Proper posture and alignment when standing, sitting, or walking—lift breastbone, keep head erect, look forward, keep shoulders back, gently tighten abdominal muscles, maintain small hollow in the lower back.
2. Standing for a long time—point feet straight ahead, do not lock knees, rest one foot on a stool or in an open cabinet, periodically switch to the other foot.
3. Sitting—use rolled towel or pillow at the small of the back, maintain upright alignment, rest feet flat on the floor or on a small footstool.

4. Standing from a chair—move hips forward to front of chair, shift weight over the feet leading with a lifted chest, stand by pushing down into the floor using leg muscles, the arm muscles can assist by pushing down on arm rests of chair.
5. Walking—hold chin in and head upright, point feet straight ahead, do not lock knees.
6. Bending—keep feet shoulder width apart, maintain straight back, bend at the hips and knees (not the waist), avoid twisting and bending together, use one hand on a stable support device, use long "grabber" tool.
7. Lifting—keep object close to the body, first kneel on one knee and stand with object close to the waist, use lightly packed plastic grocery packages with handles and carry one in each hand (following acute vertebral fracture, limit weight to 10 pounds).
8. Tying shoes—first sit in a chair, cross one foot over the opposite knee or rest one foot on a stool.
9. General pushing or pulling—maintain upright, aligned posture, avoid twisting, use legs to do the work, not the back.
10. Getting in and out of bed—sit on the side edge of the bed, lean trunk toward head of bed and lower body down with help of the arm closest to the bed; while lowering trunk to the bed, bring legs and feet onto bed, roll onto the back with knees bent; reverse for getting out of bed.
11. Reaching—only reach to a shelf that can be touched with both hands together, use only sturdy safety step stools with hand rails.
12. Coughing and sneezing—gently tighten abdominal muscles to support back, and (A) place one hand on the back, or (B) gently bend knees and place one hand on the knees, or (C) press back into chair or wall for support.

Following treatment for an acute fracture, most patients benefit from a slowly progressive exercise program. However, a thorough physical assessment including bone mass measurement is critical before recommending medications and a specific exercise program.

Following hip fracture, physical therapy and exercise can improve transfers, gait, leg strength, flexibility, and balance. A total body exercise program also should include guided progression as strength improves.

Following vertebral fracture(s), specific improvements can be made in spine extension strength, abdominal strength, strength around the shoulder blades, flexibility, balance, and posture. Forward bending of the spine or flexion exercises, especially in combination with twisting, should be avoided. Upper extremity weight training should first be performed standing with knees bent and trunk erect with one hand comfortably supported by wall contact, or in a supported, seated position, with erect trunk alignment.

Following distal forearm fracture (Colles' fracture), patients report difficulty performing such tasks as shopping, cooking, entering and exiting a car, or descending stairs compared with individuals without such fractures. Distal forearm fractures may be treated using splints, cast immobilization, external fixation, internal fixation, or combined internal and external fixation.

## General Principles of Therapeutic Exercise

1. Principle of Specificity — specific to the individual patient; specific to one or more physiological goals (bone strength, muscle strength, flexibility, cardiovascular fitness); specific to the anatomic site.
2. Principles of Progression — gradual increases in duration, intensity, and frequency; applied loads must remain below bone and connective tissue injury threshold, but be high enough to provide a greater than current activity stimulus to the organ system (muscle, heart, or connective tissue).
3. Principle of Reversibility — positive effects of exercise will be slowly lost if the program is discontinued.
4. Principle of Initial Values — those with initially low capacity have the greatest functional improvement.
5. Principle of Diminished Returns — there is a biological ceiling to exercised-induced improvements in function; approaching this limit means greater effort to achieve minimal gains.

## Rehabilitation

### Rehabilitation Following Hip Fracture

Hip fracture is a traumatic event that typically requires surgery to repair the fracture or replace the hip joint. It is important to regain as much mobility and independence as possible following hip fracture and to take steps to prevent future fractures. As the patient improves in terms of reduced pain and greater mobility, physical therapy and exercise programs can improve gait, leg strength, flexibility, and balance. A trained caregiver can safely assist the patient from a walker to a cane to unaided walking as her/his underlying health and physical status permits. Exercise principles should focus on hip-strengthening exercises. Fall prevention strategies should be implemented and should include a home-safety risk assessment and balance training. Slow-movement exercises, such as Tai Chi, should be encouraged. See the following:

#### Simple Hip-Strengthening Exercises

- Hip-flexors — Standing beside a chair, without bending at the waist, bend one knee up as close to chest as possible. Lower leg to floor. Repeat with other leg.
- Hip abductors — Standing erect and holding onto the back of a chair, without bending at the waist or knee, move one leg straight out to the side, making sure that the toes point forward. Lower the leg and repeat on other side.
- Hip-extensors — Stand holding onto the back of a chair, and bend forward about 45 degrees at the hips. Lift one leg straight out behind you as high as possible without bending the knee or moving the upper body. Lower leg and repeat on other side.

### Rehabilitation Following Vertebral Fracture

Many spinal compression fractures are asymptomatic; however, some patients suffer from acute or chronic pain. Initial treatment for acute fractures may include analgesics, bracing as described below, proper nutrition, and, if required for pain management, partial bed rest (4 days or less) that includes a few 30- to 60-minute periods each day of sitting upright and walking. Pain medications span a continuum from narcotics to over-the-counter options. There is some scientific

evidence suggesting that calcitonin is effective in reducing acute bone pain associated with a recent spinal compression fracture; however, the U.S. Food and Drug Administration (FDA) has not approved it for pain management. Several interventions such as heat/cold, facet injections, acupuncture, ultrasound, and transcutaneous electrical nerve stimulation (TENS) also may provide pain relief.

The cause of all spinal pain should be evaluated to determine the presence of osteoporosis and vertebral fractures. Loss of height resulting from vertebral collapse may cause the lower ribs to impinge on the iliac crest, causing pain from mechanical irritation. There is a correlation between reduced pulmonary vital capacity, the degree of kyphosis, and the number of vertebral fractures. Application of a posture training support (weighted kypho-orthosis) can reduce kyphotic posturing. Specific back-strengthening exercises, such as back extension and seated rowing, can improve kyphotic posturing.

#### Rehabilitation Management of Acute Back Pain in Patients with Vertebral Fracture

- Advise partial bed rest.
- Recommend analgesics.
- Treat to avoid constipation, especially in patients using opiates.
- Recommend proper posture, positioning, and activity principles to avoid undue back strain during normal activities and exercises.
- Provide and train in the use of braces or other assistive devices.
- Advise on proper type of walker.
- Train family members or caregivers to assist patients safely with minimal spine loading.
- Recommend physical and occupational therapy.
- Recommend the avoidance of resistance/strengthening exercises for the first 2 months.

#### Rehabilitation Management of Chronic Back Pain in Patients with Vertebral Fracture

- Improve any faults in posture.
- If beyond correction, consider a back support to decrease ligament stretch.
- Avoid activities that increase vertebral compression forces.
- Prescribe a sound, ongoing, therapeutic exercise program.
- Start appropriate medications, as indicated.
- Use acupuncture, biofeedback, relaxation therapy, and guided visualization as appropriate.
- Evaluate and treat psychological and social consequences.
- Consider support groups and self-management skill training.

Spinal orthoses or braces after vertebral fracture are best as a temporary adjunct to other therapies. They reduce pain by restricting spinal motion near the site of fracture and, therefore, promote earlier return to full activity; however, prolonged use of a brace (for longer than 6 weeks) may lead to weak spinal muscles and poor outcomes. (See Appendix C: Spinal Orthoses in the original guideline document.)

Following vertebral fracture, patients should avoid vigorously and repeatedly flexing or rotating the spine. Because it is important to maintain flexion, rotation, and range of motion, exercises using these motions should be done with the spine unloaded (i.e., lying down) and with attention to a slow, easy quality of movement. Since most people flex and twist the spine in normal movement patterns, new "good body mechanics" should emphasize maintaining an erect spine and head alignment while bending at the hips and knees. Because inactivity leads to additional bone and muscle loss, a careful balance between exercise and rest must be struck for each person.

Vertebroplasty and kyphoplasty are new interventions to relieve pain and restore vertebral height following vertebral compression fracture that fails conservative management. At the time the guideline was written, the FDA had not approved either procedure for pain management.

### Rehabilitation Following Distal Forearm Fracture

During the cast or bracing stage, arm elevation, early mobilization, and anti-edema control measures are implemented. Bone healing may take 6 to 12 weeks, while rehabilitation usually takes 12 weeks. Maximum recovery may take as long as 18 to 24 months.

Rehabilitation includes isometric contractions of the forearm muscle group while the arm is immobilized; active and passive range-of-motion exercises to all joints of the involved extremity, especially the shoulder and elbow; pronation and supination with forearm fully supported; and progressive resistive exercises and grip-strengthening measures, such as ball-squeezing.

## Falls

### Falls and Fall Prevention

Falls appear to precede about 90% of hip fractures, one third of vertebral fractures, and essentially all distal forearm fractures. In patients with a previous fall, a detailed medical and occupation assessment with appropriate interventions, and a home-risk assessment including modifications to the environment can reduce the risk of a subsequent fall (in 1 year) by 60%. Hip-strengthening exercises and the slow-movement martial arts exercise, Tai Chi, may improve several physical performance and psychosocial measures as well as lower the risk of falls by 40%. See "Major Risk Factors for Falls" below.

### Major Risk Factors for Falls

#### Environmental risk factors

- Low-level lighting
- Obstacles in the walking path
- Loose throw rugs
- Lack of bathroom assist devices
- Slippery outdoor conditions

#### Medical risk factors

- Age
- Female gender
- Poor vision
- Urge urinary incontinence
- Previous fall
- Orthostatic hypotension
- Impaired transfer and mobility
- Medications (analgesics, anticonvulsants, psychotropics)
- Depression
- Reduced problem-solving or mental acuity and diminished cognitive skills
- Anxiety and agitation
- Malnutrition

#### Neuromuscular risk factors

- Poor balance
- Weak muscles
- Kyphosis
- Reduced proprioception

#### Fear of Falling

#### Hip Protectors

Hip protective pads, worn in the side pockets of stretchy undergarments, were shown to protect against hip fractures in an elderly nursing home population, but compliance is difficult to obtain. However, these devices should be considered for elderly individuals at risk for hip fracture following a fall.

#### CLINICAL ALGORITHM(S)

None provided

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Scientific evidence was derived from basic research, consensus from an expert panel convened by the National Osteoporosis Foundation (NOF), clinical studies, and randomized controlled clinical trials.

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

Overall Benefits

- Improved management of osteoporosis and prevention of osteoporotic fractures and associated morbidity (chronic pain, disability, deformity, depression) and mortality

#### Specific Benefits

- Drug therapies reduce risk for vertebral and hip fractures, stabilize, and even increase bone mineral density.
- Hip protectors may reduce the occurrence of hip fractures in elderly individuals at high risk for falls.

#### Subgroups Most Likely to Benefit

- Patients over age 70 years with multiple risk factors for osteoporotic fractures

#### POTENTIAL HARMS

- Patient discomfort and concern about appearance of hip protectors (which limit compliance)
- Side effects of pain and osteoporotic medications

### CONTRAINDICATIONS

#### CONTRAINDICATIONS

##### Potential Contraindications to Rehabilitation of Osteoporosis

- Prolonged use of spinal orthoses or braces (for longer than 6 weeks) may lead to weak spinal muscles and poor outcomes.
- Hip protectors may interfere with patient compliance.

### QUALIFYING STATEMENTS

#### QUALIFYING STATEMENTS

- This guideline does not define standards of care for legal, ethical, or other purposes, nor is it intended to dictate an exclusive course of medical management. Rather, this guideline presents science-based methods and expert clinical judgment that may be used as a reference point for clinical decision-making.
- The information presented may differ from recommendations of other organizations. Moreover, variations of practice that take into account the needs of the individual patient, resources, and limitations unique to the institution or type of practice may be appropriate. Because research into the prevention, diagnosis, treatment, and rehabilitation of osteoporosis is a dynamic process, this document will be subject to periodic adjustment as scientific knowledge advances.
- These recommendations are not intended as rigid standards of practice but should be tailored to meet individual patient needs.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Pocket Guide/Reference Cards

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Living with Illness  
Staying Healthy

### IOM DOMAIN

Effectiveness  
Patient-centeredness  
Safety

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

National Osteoporosis Foundation. Health professional's guide to rehabilitation of the patient with osteoporosis. Washington (DC): National Osteoporosis Foundation; 2003. 31 p. [10 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2003

### GUIDELINE DEVELOPER(S)

American Academy of Orthopaedic Surgeons - Medical Specialty Society  
American Academy of Pain Medicine - Professional Association  
American Academy of Physical Medicine and Rehabilitation - Medical Specialty

Society

American Association of Clinical Endocrinologists - Medical Specialty Society  
American College of Obstetricians and Gynecologists - Medical Specialty Society  
American College of Radiology - Medical Specialty Society  
American Geriatrics Society - Medical Specialty Society  
American Medical Association - Medical Specialty Society  
American Society for Bone and Mineral Research - Professional Association  
International Society for Physical Medicine and Rehabilitation - Medical Specialty Society  
National Osteoporosis Foundation - Disease Specific Society

#### GUIDELINE DEVELOPER COMMENT

Not applicable

#### SOURCE(S) OF FUNDING

National Osteoporosis Foundation

#### GUIDELINE COMMITTEE

Development Committee

#### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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#### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

#### GUIDELINE STATUS

This is the current release of the guideline.

#### GUIDELINE AVAILABILITY

Electronic copies: Not available at this time.

Print copies: Available from NOF, 1232 22nd Street, NW, Suite 500, Washington, DC 20037.

#### AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Lindsay R, Meunier PJ. Health professional's guide to rehabilitation of the patient with osteoporosis. Osteoporosis Int 2003; 14(Suppl 2):S1-S22.
- National Osteoporosis Foundation. Pocket guide to rehabilitation of the patient with osteoporosis. Washington, DC: National Osteoporosis Foundation, 2003. 8 p.

Print copies: Available from NOF, 1232 22nd Street, NW, Suite 500, Washington, DC 20037.

## PATIENT RESOURCES

None available

## NGC STATUS

This summary was completed by ECRI on January 21, 2004. The information was verified by the guideline developer on March 3, 2004.

## COPYRIGHT STATEMENT

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